

## REMARKS

The present application was filed on December 7, 2000 with claims 1 through 24. Claims 1 through 24 are presently pending in the above-identified patent application.

5 In the Office Action, the disclosure and claims 2, 11, and 18 were objected to because of indicated informalities. In the Office Action, the Examiner rejected claims 1, 3, 7-9, 17, 19-22, and 24 under 35 U.S.C. §102(b) as being anticipated by Pearson (United States Patent Number 5,400,434), rejected claims 4, 10, 12, 15, 16, and 23 under 35 U.S.C. §103(a) as being unpatentable over Pearson in view of Antonov (United States  
10 Patent Number 4,278,838), and rejected claims 2, 11, and 18 under 35 U.S.C. §103(a) as being unpatentable over Pearson, and further in view of Narayan (United States Patent Number 5,490,234). The Examiner indicated that claims 5, 6, 13, and 14 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

15 The present invention is directed to a speech synthesis system that utilizes a pitch contour resulting in a more natural-sounding speech. The present invention modifies the predicted pitch,  $b(t)$ , for synthesized speech using a low frequency energy booster. The low frequency energy booster interpolates the discrete pitch values, if necessary, and increase the amount of energy of the pitch contour associated with low  
20 frequency values, such as all frequency values below 10 Hertz. The amount of energy of the pitch contour associated with low frequency values can be increased, for example, by adding band-limited noise (a carrier signal) to the pitch contour,  $b(t)$ , or by filtering the pitch values with an impulse response filter having a pole at the desired low frequency value. The present invention serves to add vibrato to the to the original pitch contour,  
25  $b(t)$ , and thereby improves the naturalness of the synthetic waveform.

Formal Objections

The disclosure was objected to because it is unclear according to the specification (page 4, lines 15-18, and page 5, lines 4-8) whether the invention “boosted energy of the pitch contour from below 10 Hertz or boosted with the range  $\pm 10$  Hz.”  
30 Claims 2, 11, and 18 were objected to because it is unclear whether the energy increased within the range of 10 Hz or from below 10 Hz.

Applicants note that the first citation from the specification (page 4, lines 15-18), recites increasing “the amount of energy of the pitch contour associated with low frequency values, such as below 10 Hertz.” Thus, a person of ordinary skill in the art would recognize that only the frequency values of the pitch contour that are below 10 Hz have their amount of energy increased. The second citation (page 5, lines 4-8) clearly states that the “original pitch contour,  $b(t)$  is *varied* by  $\pm 10$  Hz.” (Emphasis added.) Thus, in this second case, a range of  $\pm 10$  Hz is indicated, as would be apparent to a person of ordinary skill in the art.

Applicants also note that claims 2 and 11 clearly state that only components with a *frequency value of under 10 Hz* are affected by said increasing and adding steps, respectively. Claim 18 clearly states that the pole of an impulse response filter has a *frequency value below 10 Hz*. Thus, Applicants respectfully request that the objection to the disclosure be withdrawn.

#### Independent Claims 1, 10, 17 and 22

Independent claims 1, 17 and 22 were rejected under 35 U.S.C. §102(b) as being anticipated by Pearson.

Regarding claim 1, the Examiner asserts that Pearson teaches “increasing an amount of energy in low frequency components of said pitch contour” (col. 7, lines 7-18, particularly read on “the frequency can be raised by taking fewer points”). Regarding claim 17, the Examiner asserts that Pearson discloses “filtering said pitch contour with an impulse response filter having a pole at a desired low frequency value” (col. 6, lines 12-41).

Applicants note that Pearson is directed to raising or lowering the basic pitch by resampling, which is a *linear warping of the frequency axis*. The present invention is directed to leaving the basic pitch unchanged, but *adding some very low frequency variation* (similar to vibrato) to increase naturalness. This is a non-linear operation and is not disclosed by Pearson. Independent claims 1 and 22 require *increasing an “amount of energy in low frequency components of said pitch contour.”*

Applicants also note that, in the text cited by the Examiner (col. 6, lines 12-41), Pearson discloses that the “signal from the digital inverse filter is passed through a sharp *low pass filter*.” (Emphasis added.) Pearson does not disclose or suggest,

however, that the pitch contour is filtered with an impulse response filter having a pole at a desired low frequency value. Independent claim 17 requires “*filtering said pitch contour with an impulse response filter having a pole at a desired low frequency value.*”

Thus, Pearson does not disclose or suggest increasing an amount of energy  
 5 in low frequency components of said pitch contour, as required by independent claims 1 and 22, and does not disclose or suggest filtering said pitch contour with an impulse response filter having a pole at a desired low frequency value, as required by independent claim 17.

#### Independent Claim 10

10 Independent claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over Pearson in view of Antonov. In particular, the Examiner acknowledges that Pearson does not explicitly teach “adding band limited noise to said pitch contour,” but asserts that Antonov discloses this limitation (col. 4, line 44, to col. 5, line 10).

15 Applicants note that Antonov discloses *modulating the amplitude* of the pitch (frequency) signal by +/- 3% for naturalness, but does not disclose *adjusting the frequency of the primary component of this signal* (“pitch”). Independent claim 10 requires *adding band limited noise to said pitch contour*.

Thus, Pearson and Antonov, alone or in combination, do not disclose or  
 20 suggest adding band limited noise to said pitch contour, as required by independent claim 10.

#### Dependent Claims 2-9, 11-16, 18-21 and 23-24

Dependent claims 3, 7-9, 19-21, and 24 were rejected under 35 U.S.C. §102(b) as being anticipated by Pearson, claims 4, 12, 15, 16, and 23 were rejected under  
 25 35 U.S.C. §103(a) as being unpatentable over Pearson in view of Antonov, and claims 2, 11, and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Pearson, and further in view of Narayan.

Claims 2-9, 11-16, 18-21 and 23-24 are dependent on claims 1, 10, 17, and 22, respectively, and are therefore patentably distinguished over Pearson, Antonov, and  
 30 Narayan (alone or in any combination) because of their dependency from independent claims 1, 10, 17, and 22 for the reasons set forth above, as well as other elements these

claims add in combination to their base claim. The Examiner has already indicated that claims 5, 6, 13, and 14 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

5 All of the pending claims, i.e., claims 1-24, are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

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Respectfully submitted,



Date: September 7, 2004

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Kevin M. Mason  
Attorney for Applicants  
Reg. No. 36,597  
Ryan, Mason & Lewis, LLP  
1300 Post Road, Suite 205  
Fairfield, CT 06824  
(203) 255-6560

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